

## **Funded Research Projects for FY 95-96**

**TITLE:** Breeding Improved 2-Rowed Barley Varieties Adapted  
To Montana and Developing Barley Varieties for Improved  
Market Penetration

**INSTITUTION:** MSU

**DEPARTMENT:** Plant and Soil Sciences

**RESEARCHERS:** Tom Blake

**AMOUNT FUNDED:** \$60,000

**OBJECTIVES:**

1. To continue improving the adaptation and performance of feed and malt barley varieties for production in Montana.
  2. To incorporate new traits into our malting barley germplasm base which will permit exploitation of new marketing opportunities.
  3. Identify genetic components of barley digestibility in cattle and develop strategies for exploitation of this information.
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**TITLE:** Development of Rapid Feed Quality Analysis  
Technology for Barley

**INSTITUTION:** MSU

**DEPARTMENT:** Animal Range

**RESEARCHERS:** Janice Bowman, Ph.D  
Tom Blake, Ph.D

**AMOUNT FUNDED:** \$25,000

**OBJECTIVES:**

1. To develop near infrared reflectance spectroscopy (NIRS) technology to rapidly select for feed quality in barley.
2. To measure the range of feed quality variation available

in barley germplasm.

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**TITLE:** Enhanced field selection for wheat stem sawfly  
resistance in wheat

**INSTITUTION:** MSU

**DEPARTMENT:** Plant and Soil Sciences

**RESEARCHERS:** Phil Bruckner, PSES  
Greg Kushnak, Conrad Research Center  
Jim Berg, PSES

**AMOUNT FUNDED:** \$10,000

**OBJECTIVES:**

1. Subject early-generation segregating winter wheat bulk populations and derived lines to heavy selection pressure for wheat stem sawfly resistance and select plant phenotypes resistant to wheat stem sawfly infestation and cutting damage.
2. Evaluate spring and winter wheat cultivars and advanced lines for resistance to infestation and cutting damage by wheat stem sawfly and for yield performance under heavy infestation by wheat stem sawfly.
3. Systematically evaluate selected germplasm from the U.S. National Small Grains Collection (NSGC) and other sources for enhanced stem solidness and wheat stem sawfly resistance.
4. Provide a field site, representative of sawfly-infested production regions, for demonstration to producers of effective sawfly management strategies including use of resistant cultivars.

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**TITLE:** Winter Wheat Breeding/Genetics

**INSTITUTION:** MSU

**DEPARTMENT:** Plant and Soil Sciences

**RESEARCHERS:** Phil Bruckner, PSES  
Jim Berg, PSES

Lou Kuifu, PSES

**AMOUNT FUNDED:** \$60,000

**OBJECTIVES:**

1. Develop improved cultivars of winter wheat adapted to Montana climatic conditions and cropping systems, which possess superior grain yield potential, winterhardiness, adequate and durable pest resistance, stress tolerance, superior agronomic characteristics, and end-use qualities.
2. Advance early-generation segregating bulk populations and evaluate derived lines at Research Center locations under natural and enhanced selection pressure for winter survival and pest resistance and select favorable plant types for further testing.
3. Investigate environmental, genetic, and management factors which influence wheat productivity and end-use in Montana including 1995 projects: identification and incorporation of new sources of stem solidness and WSMV resistance, population structure of wheat stem sawfly, cultivar variability for cold tolerance and coleoptile length, and critical overwintering plant population survival.
4. Coordinate Montana statewide winter wheat variety testing program and provide long-term performance data necessary for cultivar release decisions, variety recommendations, and producer management decisions.

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**TITLE:** Combine Replacement for the Post Farm

**INSTITUTION:** MSU

**DEPARTMENT:** Plant and Soil Science

**RESEARCHERS:** Jeff Jacobsen, Interim PSES Dept. Head  
Howard Bowman, Manager Foundation Seed Program

**AMOUNT FUNDED:** \$15,000

**OBJECTIVES:**

To replace the 1974 Gleaner K combine at the Post Farm.

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**TITLE:** Development, Implementation, and Evaluation of Pest Management Strategies Towards Reducing Wheat Stem Sawfly Losses in Wheat

**INSTITUTION:** MSU

**DEPARTMENT:** Entomology

**RESEARCHERS:** Dr. Greg Johnson, Entomology

**AMOUNT FUNDED:** \$22,576

**OBJECTIVES:**

1. Initiate on-farm demonstrations of current pest management strategies that will reduce losses caused by WSS.
2. Conduct on-farm tours of WSS pest management demonstrations; incorporate on-farm demonstration results into developing new strategies and making recommendations for wheat growers on WSS management.
3. Develop day-degree models to predict WSS adult emergence and longevity.

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**TITLE:** Evaluation of genetic diversity measures in wheat

**INSTITUTION:** MSU

**DEPARTMENT:** Plant and Soil Sciences

**RESEARCHERS:** Jack Martin, PSES

**AMOUNT FUNDED:** \$8,000

**OBJECTIVES:**

1. Refine and improve estimates of genetic diversity based on molecular marker data.
2. Use genetic distance measures to predict progeny performance and variation in hard red spring wheat crosses.

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**TITLE:** Impact of plant disease on the ability of producers  
to comply with the Residue Compliance Program

**INSTITUTION:** MSU

**DEPARTMENT:** Plant Pathology

**RESEARCHERS:** Don Mathre, Plant Pathology  
Bill Grey, Plant Pathology  
Greg Kushnak, Western Triangle Research Center

**AMOUNT FUNDED:** \$18,000

**OBJECTIVES:**

1. Determine the effect of residue conservation on the development and impact of plant disease on barley production.
2. Determine the susceptibility of currently grown winter wheat, spring wheat, and barley cultivars to residue-borne pathogens.
3. Evaluate the lines of winter wheat, spring wheat, and barley currently under development for their disease reaction to residue-borne pathogens.

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**TITLE:** Wheat Stem Sawfly Research

**INSTITUTION:** MSU

**DEPARTMENT:** Entomology

**RESEARCHERS:** Wendell Morrill, Entomology  
Gregory Kushnak, Agronomy

**AMOUNT FUNDED:** \$25,000

**OBJECTIVES:**

1. Produce new types of sawfly resistance that can be used in wheat breeding lines.

2. Test insecticides for sawfly control.
3. Monitor the interaction between plant growth, sawfly wasp emergence, and parasite activity.
4. Deliver current information from sawfly research projects to wheat producers.

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**TITLE:** Confirmation of the Nutritive Value of Franubet Barley for Broiler Chicks

**INSTITUTION:** MSU

**DEPARTMENT:** Plant Soil & Environmental Sciences

**RESEARCHERS:** C. W. Newman, PSES

**AMOUNT FUNDED:** \$3,650

**OBJECTIVES:**

To confirm the nutritive value of Franubet barley as basal grain for broiler chicks.

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**TITLE:** Comparative Evaluation of Montana and Japanese Food Barleys: Effects of Variety, Growing Environment and Processing on Chemical Composition, Color/Texture Characteristics, Food Products and Nutritional Value

**INSTITUTION:** MSU

**DEPARTMENT:** Plant Soil & Environmental Sciences

**RESEARCHERS:** Rosemary K. Newman, PhD, RD, PSES  
C. Walt Newman, PhD, PSES

**AMOUNT FUNDED:** \$40,000

**OBJECTIVES:**

To promote the use of Montana food barley in Japan through collaborative studies with the Japanese National Institute of Health and Nutrition and the All Japan Food Barley Processors.

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**TITLE:** Development of Superior Wheat for Montana by Genetic Transformation

**INSTITUTION:** MSU

**DEPARTMENT:** Plant, Soil & Environmental Sciences

**RESEARCHERS:** Dr. Rongda Qu, Assistant Research Professor,  
PSES

**AMOUNT FUNDED:** \$20,000

**OBJECTIVES:**

1. To finally obtain wheat strains resistant to wheat streak mosaic virus (WSMV) by transformation of wheat with the viral genes.
2. To transform wheat with available genes for improvement of drought resistance.

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**TITLE:** Developing methods for prevention and control of the wheat curl mite and wheat streak mosaic virus

**INSTITUTION:** MSU

**DEPARTMENT:** Interdepartmental

**RESEARCHERS:** Dr. Jack Riesselmann, Ext. Plant Pathology  
Dr. Greg Johnson, Entomology  
Dr. Sue Blodgett, IPM  
Dr. Phil Bruckner, PSES  
Dr. Luther Talbert, PSES

**AMOUNT FUNDED:** \$44,000

**OBJECTIVES:**

- I. Varietal evaluations of WSM tolerance
  - A. Determine the yield of Montana's predominant spring and winter wheat lines when naturally infected with WSMV.
  - B. Evaluate WSMV severity in selected line rows of

Judith, Winalta and Sawfly resistant lines that exhibited tolerance in 1993.

C. Utilize virus carrying mite colonies to initiate screening programs and evaluate selected line rows carrying incorporated resistance.

D. Evaluate post harvest tillage methods which enhance uniform volunteer development leading to suppression of green bridges.

## II. Entomological Investigations

A. Identify and determine the relative importance of over summering reservoirs for WCM and SWMV.

B. Evaluate cultivar resistance to the WCM and correlate this to WSMV reactions utilizing systemology and yield parameters.

C. Ascertain efficacy of miticides.

D. Evaluate WCM movement and dispersal following application of glyphosate.

## III. Cereal breeding program

A. Identify molecular markers for WSM 1, resistant gene for WSMV and transfer the gene into adapted Montana winter and spring wheats, by conventional and molecular techniques.

**TITLE:** Changing Canadian Grains Policies: Consequences and Opportunities for Montana's Grain Industry

**INSTITUTION:** MSU

**DEPARTMENT:** Extension Service and MT Ag Experiment Station

**RESEARCHERS:** Dr. Vincent Smith, Ag Econ  
Dr. Charles Rust, Ag Econ  
Dr. Linda M. Young, Ag Econ  
Dr. James B. Johnson, Ag Econ

**AMOUNT FUNDED:** \$25,000

**OBJECTIVES:**

1. To investigate the effects of the removal of a transportation subsidy for Canadian grain on the marketing decisions of the Canadian Wheat Board by:
  - a. Measuring changes in the relative profitability of exporting to the U.S. market versus the Canadian west and east coast offshore markets.
  - b. Measuring the impacts of these changes on Montana and other U.S. markets.
2. To examine how the removal of the transportation subsidy will change the production decisions of Canadian prairie grain producers. This will depend on changes in the relative profitability of wheat, barley, and specialty crops.
3. To analyze the consequences of proposed changes in the role and power of the Canadian Wheat Board and on the marketing of Canadian grain by:
  - a. Measuring how much more Canadian grain will be marketed through Montana.
  - b. Determining the impacts of these additional grain flows on Montana producers, communities, and grain companies.

These effects will be investigated under two widely discussed proposals for future Canadian grain marketing systems:

- a. The Continental Grain Market under which Canadian farmers would market their own grain within North America, while the Canadian Wheat Board maintains control over offshore exports.
- b. The Dual Marketing System under which Canadian farmers would be unrestricted in their marketing decisions.

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**TITLE:** Spring Wheat Breeding and Genetics

**INSTITUTION:** MSU

**DEPARTMENT:** Plant, Soil & Environmental Sciences

**RESEARCHERS:** Dr. Luther Talbert, PSES

Susan Lanning, PSES

**AMOUNT FUNDED:** \$60,000

**OBJECTIVES:**

1. To develop spring wheat varieties for Montana with the following attributes:
  - a. Sawfly resistant varieties with superior agronomic and end-use properties.
  - b. Russian wheat aphid resistant varieties.
  - c. Hard white spring wheat varieties.
  - d. Varieties with combinations of the above attributes.
2. To manage the varietal testing program for spring wheat in Montana.
3. To provide information and materials to insure the long-term productivity of the spring wheat breeding program.

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**TITLE:** Upgrading and Enhancement of the Infrastructure of the Cereal Quality Laboratory at MSU

**INSTITUTION:** MSU

**DEPARTMENT:** Plant, Soil & Environmental Sciences

**RESEARCHERS:** Dr. Katharine A. Tilley

**AMOUNT FUNDED:** \$86,000

**OBJECTIVES:**

The objectives of this proposal are quite simple. There is an urgent need to replace much of the aging and failing equipment which presently exists in the Cereal Quality Laboratory (CQL) at MSU. In order to appropriately and efficiently serve the needs of the spring and winter wheat breeder and the barley breeder at MSU, the CQL must maintain the instruments and equipment which are vital to the basic needs of these breeders. The foremost task of the CQL is to be able to

properly analyze the quality parameters of wheat flour and dough and to be able to perform accurate test baking with the breeders' samples. This is done strictly to provide the breeders with vital information regarding the expected baking performance of their experimental varieties in order to give them the information they need to properly direct their breeding programs. My goal, as Director of the CQL, is to upgrade the CQL in terms of techniques, expertise and equipment to insure that the data which is obtained by the CQL staff is of the highest quality and is performed in the most efficient manner possible. An additional goal is to ensure that MSU develops and maintains a well respected cereal quality laboratory and establishes a national reputation for high quality cereal research. Many steps have been taken in that direction, but clearly the need to replace certain vital pieces of equipment persists.

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**TITLE:**       Glutenin Protein Structural Studies:   Baking Quality  
                  Defined at the Molecular Level

**INSTITUTION:**   MSU

**DEPARTMENT:**   Plant, Soil & Environmental Sciences

**RESEARCHERS:**   Dr. Katherine Tilley, PSES

**AMOUNT FUNDED:**         \$5,250

**OBJECTIVES:**

Characterization of the carbohydrates involved in the glycosylation of the glutenin proteins of wheat and prediction of the relationship to baking quality.

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**TITLE:**       Fall seed dormancy in selected barley varieties

**INSTITUTION:**   MSU

**DEPARTMENT:**   Interdepartmental

**RESEARCHERS:**   Gregg R. Carlson, Northern Ag Research Center  
                  Greg D. Kushnak, Western Triangle Research  
Center

Pat F. Hensleigh, PSES

**AMOUNT FUNDED:** \$5,000

**OBJECTIVES:**

Determine relative post harvest seed dormancy of selected barley varieties and lines using controlled environment and field results.

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**TITLE:** Evaluation of various materials and practices contributing toward economic crop production under flexible, continuous and other cropping systems in Montana.

**INSTITUTION:** MSU

**DEPARTMENT:** Research Centers

**RESEARCHERS:** Faculty members at the following Research Centers:

Central Ag Research Center, Mocassin  
Eastern Ag Research Center, Sidney  
Northern Ag Research Center, Havre  
Northwestern Ag Research Center, Kalispell  
Southern Ag Research Center, Huntley  
Western Triangle Ag Research Center, Conrad

**AMOUNT FUNDED:** \$60,000

**OBJECTIVES:**

1. To evaluate the effects of differing systems on crop and variety performance under diverse environments represented across the Montana Ag Experiment Station - Research Center network.
  2. To evaluate the potential fit of other materials, concepts and techniques with various cropping systems employed.
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**TITLE:** Development and Evaluation of Spring Barley, Spring Wheat and Winter Wheat Cultivars Adapted to Montana

**INSTITUTION:** Western Plant Breeders

**DEPARTMENT:**

**RESEARCHERS:** Dr. Dale Clark  
Mr. Craig Cook  
Mr. Earl Giard  
Ms. Jeanne Heilig  
Mr. Mike DeVries  
Dr. Dan Biggerstaff

**AMOUNT FUNDED:** \$8,600

**OBJECTIVES:**

1. Continue development of very high yielding, semidwarf feed barleys adapted to irrigated and higher rainfall areas of Montana.
  2. Evaluate and release a performance-competitive, naked, waxy, two-rowed, barley adapted to Montana growing conditions.
  3. Continue development of yield competitive, high quality spring wheat cultivars for Montana growers.
  4. Evaluate and release a higher-quality, sawfly resistant spring wheat.
  5. Evaluate and release a sawfly resistant winter wheat.
  6. Evaluate and release a soft white winter wheat for the high-rainfall and irrigated growers in Montana.
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